

On Farm Research And Extension Linkages : A Case Study from Improvement of Wood Energy Systems in Palm Sugar Industry on Sathing Phra Peninsula-Southern Thailand

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Abstract

The improvement process of wood energy systems in palm sugar industry on Sathing Phra Peninsula is a successful example of the development oriented research on agrarian system process incorporating a preliminary phase of precise and accurate diagnosis, on-farm research methodologies and good links between research and extension works. This paper describes the major constraints to adopting the two pan stove drawn from the evaluation phase of the past innovation, and the reorientation of research and extension activities to overcome the problems which were reported. The one-open pan stove with a chimney and grate and its transportable metallic knock down mould were designed and tested in close cooperation with the small producers. The same concepts and means of execution of the extension activities as used for the two-pan stove were repeated with the new stoves. Monitoring of adoption of the innovation in the local conditions of production after a one year period of successful extension in 1990 is presented.

Introduction

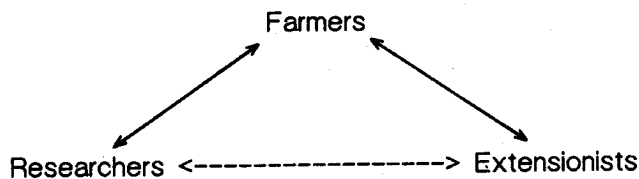
The linkage of the development-oriented research on agrarian system iterative process and relations for improvement of the wood energy systems (Trebuil and Singrat, 1990) is shown in Figure 1. The overall framework for improving the efficiency of sugar palm boiling stoves research and extension has 3 major objectives:

First, testing of an on-farm designed stove under the real conditions of the farmers.

Second, extension and training for construction of improved stoves to concerned producers.

Third, evaluation of the adoption to learn about farmers' problems and constraints and the performance of the improved innovation in order to be able to improve the method of extension, to feed back into the design and testing phase with new topics for participative applied researches and even refine the conclusions of the preliminary diagnosis, and to modify the improved technology to better fit with farmers, conditions.

Usually there are three types of people involved in the reinforcement of the agricultural extension network. The relationships between partners can be symbolized in the following linkages.



It is clear that the researchers should adapt their technical references to the real conditions of production faced by the farmers and thus the extension workers should be able to provide adapted technical advice for farmer adoption (Trebull, 1988). Traditional links between research and extension programs do not usually exist at the farm level with the result that researchers and extensionists often conduct their activities in virtual isolation from each other (Craig, 1988).

For this case study, as soon as a proposed innovation had been successfully tested and verified in close cooperation with the producers in 1986 (Singrat et al., 1988), the extension phase for the two-pan stove was started (Thammaratwasik et al., 1986). The subsequent evaluation of the adoption of the innovation by the producers was appraised (Trebull et al., 1988). It should be mentioned that the link between research and extension programs for improving the wood energy systems in palm sugar production on Sathing Phra peninsula does exist at the farm level with the result that researchers and extensionists comprise a single team.

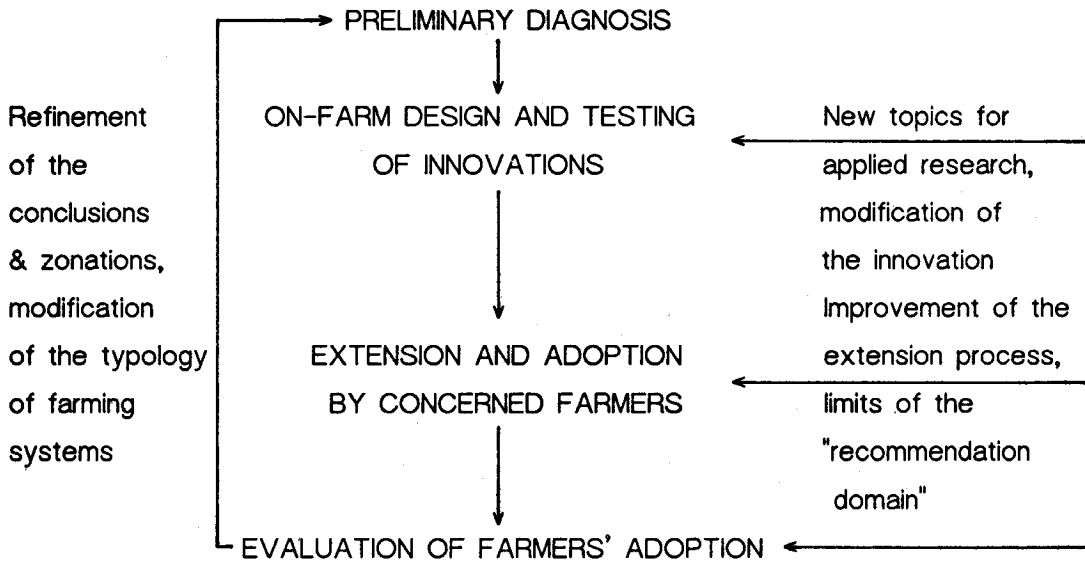


Figure 1. The linkage of the development-oriented research on agrarian system iterative process and their relations.

Reorientation of Research Activities

Regarding Stoves

The major constraint identified from the evaluation was that the capacity of the proposed two-pan stove was suitable only for the conditions of a group of relatively big producers who are used to import large quantities of rubber wood. In order to induce more producers to consider the adoption of a more efficient kind of evaporator, a new model, with a lower capacity was designed and tested on farm in order to fit with the farmers' conditions when only 20-30 palms are tapped at the peak of the sugar producing season. This group of producers represents 43% of the total number of households surveyed. There was universal consensus that a design similar to the present two-pan stove, but with only one pan, was highly desirable.

During the 1988 producing season, an on-farm design and testing of one-open-pan stove using a grate and chimney were undertaken (Figure 2). A comparative study of the efficiency of one-and two-open pan stoves with grates and chimneys was also made (Singrat et al., 1989)

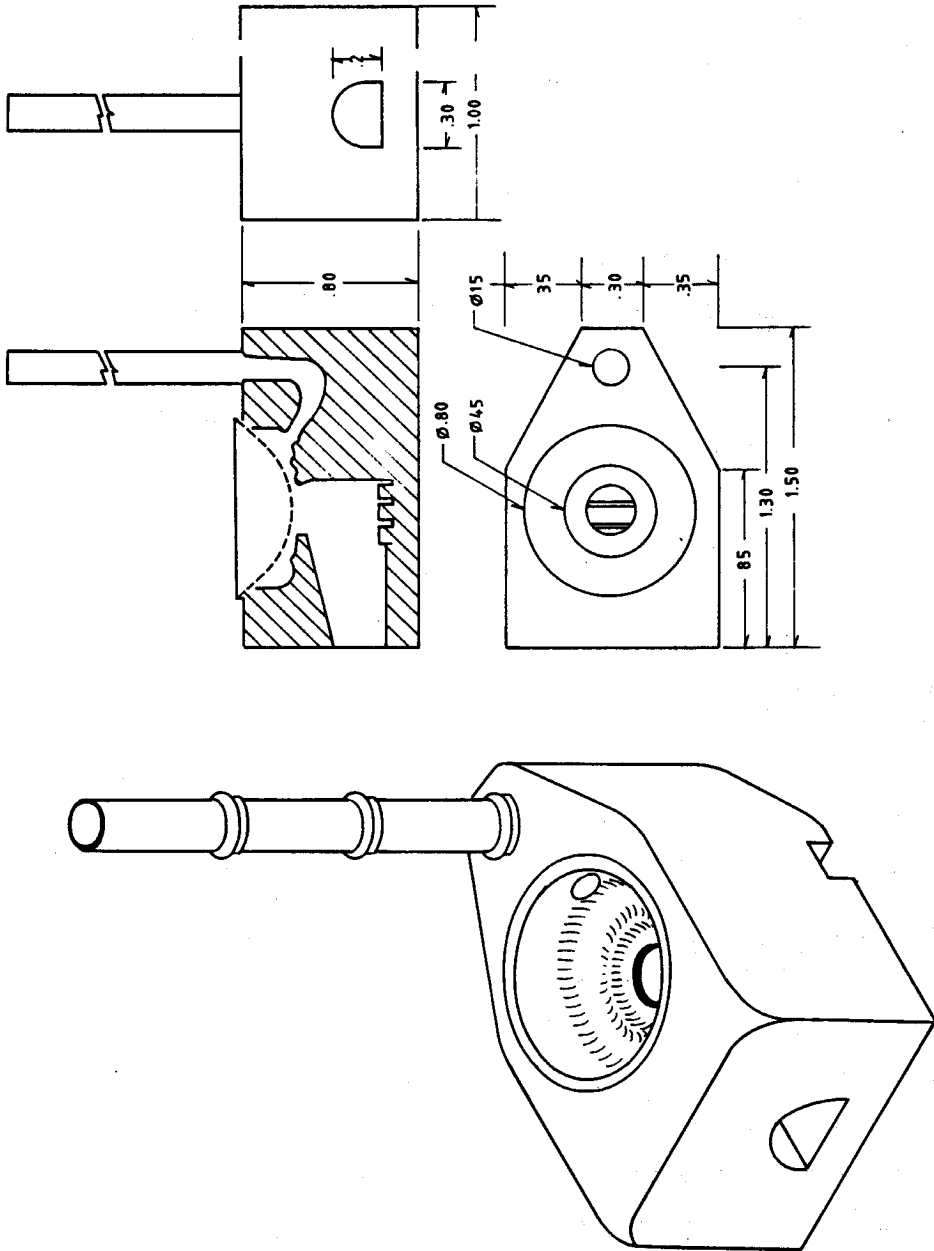


Figure 2. One-pan stove of Sathing Phra area.

Regarding the transportable metal knock down mould.

From interviews with concerned palm sugar producers, the minor disincentives to adopting the two-pan stove included:

- the difficulty in finding a large amount of clay in some places,
- the large amount of work involved in building such a large stove,
- the perceived waste involved in having to boil water in the second pan when there is insufficient sap for the second pan,
- design problems such as non-durability of the chimney, and general problems with heat and gas flow. The usual problem was that the second pan did not boil vigorously. Others said that gases exited from the front of the stove or that the designed stove failed to perform adequately.

Transportable metallic knock down moulds for one-and two-pan stoves were designed and constructed to solve the design and construction problems reported. The design attempted to achieve optimal economy of construction, robustness and durability, ease of operation and suitability to local circumstances. The major features of the transportable metallic knock down mould design of one-and two-open pan stoves are shown in Figure 3 and Figure 4, respectively.

The main advantages of transportable metal knock down mould of one and two-open-pan stoves are :

- The knock down moulds allow for easy assembly, loading of the clay soil and other materials for reinforcement dismantling and transport in the field.
- Clay soil and other materials for reinforcing, the body of stove are packed in a standard sized mould. This ensures maximum control of proper internal size of the combustion chamber, flue gas passage, ash hole and air inlet during the construction process. Several deviations which had occurred during past building could thereby be prevented.
- The amount of clay soil used with the two-pan knock down mould is reduced by almost 20% of that required by the prototype. The wooden planks and pegs are no longer require for building stove wall.

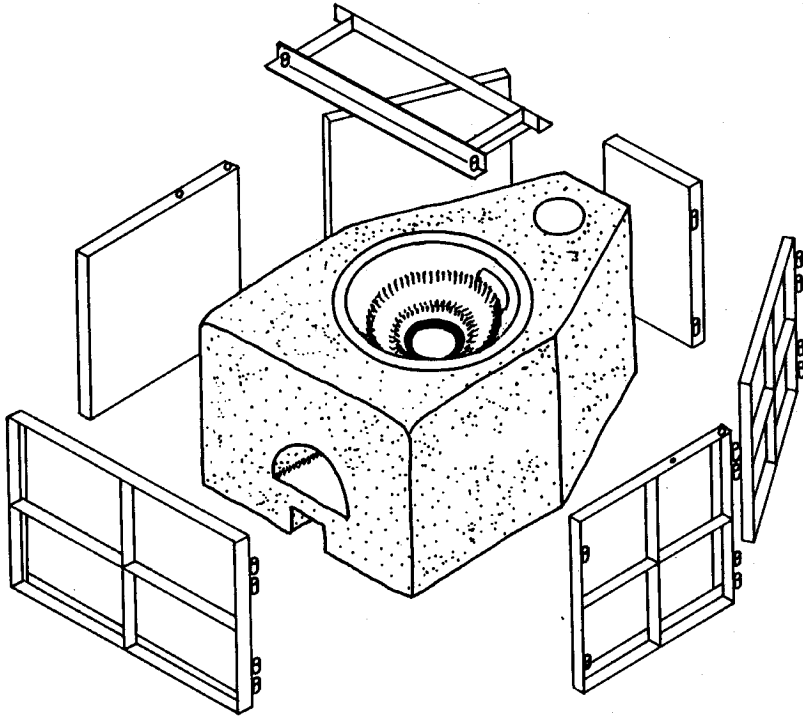


Figure 3. Assembly of standard transportable metal knock down mould of one-pan stove.

- Non-durability of the chimney was solved by using high quality cementing concrete mixtures controlled by the producers themselves. The six inches diameter concrete tubes previously used as chimneys are unavailable in the market now and the knock down mould plays an important role in processing a chimney which requires less maintenance and is easy to clear out the tars which collect inside its cylindrical surface.
- Unskilled personnel can be trained quickly and easily to operate these units for building stoves.
- The knock down mould can be constructed locally from sheet metal in a small engineering workshop nearby which are found in the provinces.

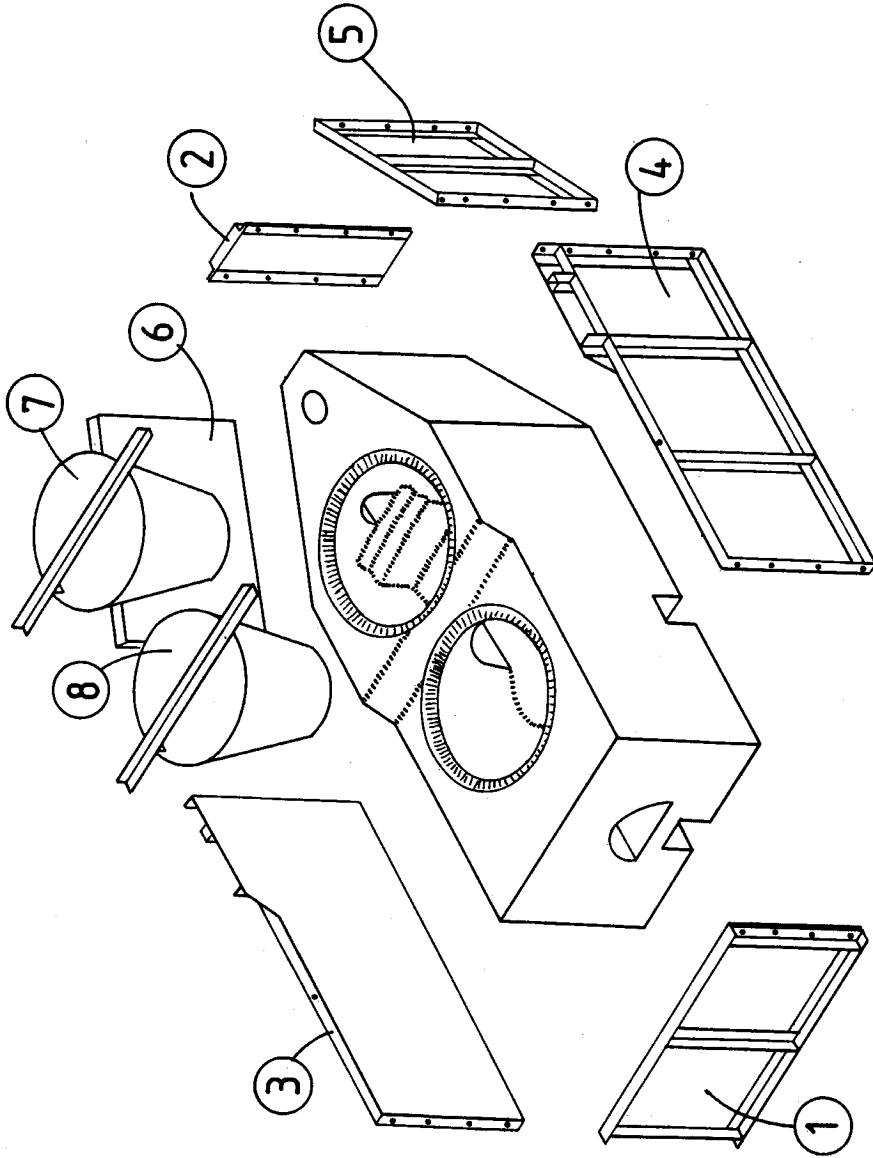


Figure 4. Assembly, of standard transportable metal knock down mould of two open pan stove

- All standard transportable metal knock down moulds can be supplemented with some reinforcement such as wooden pegs or iron bars to protect the mould during handling.

The disadvantages of using knock down moulds are :

- The manufacture of the mould requires an initial investment which has to be considered when estimating the cost of building the stove.
- Basic mechanical workshop skills and equipment must be available.
- The steel used in the mould construction has to be imported from outside the area.
- The life span of the metallic knock down mould is only 3 to 4 years. Its working life span can be extended by using high quality steel with robust and rust-resistant properties.

Extension Activity

Concept of the extension activities.

Crop calendars were used to plan the intensive activities of the extension phase. Sugar-rice producers are very busy most of the year. Clearly identified peaks of labor periods were as follows:

- January to June : Peak of palm sugar production
- October to November : Rice transplanting and weeding-thinning in sown paddies.

Hence the project training programmes took place each year either in August-September (after the palm sugar producing season and before the rice cycle or in December (after the rice implantation and before the palm sugar season).

Each training programme was prepared in close cooperation with the district and sub-district authorities as well as the local office of agricultural extension in order to involve these key agencies in charge of rural development in the project activities (selection of the trainees according to their readiness to accept the new technology, the importance of the quality of sap they are processing and their difficult financial situation; distribution of the materials for stove construction, etc.) and their future continuation. Thus, during the past months, a series of transportable metal knock down

moulds of one-and two-open pan stoves to be used in the construction of standard improved stoves have been distributed to the district authorities who will be in charge of their management.

It was also decided that for each new improved stove to be built, the farmer will provide all the local materials (clay, wood, jars, etc) and the project provides all the imported ones (bricks, iron bars, chimney).

The two parts of the regular extension activities.

A typical two-day training programme, usually carried out at a local school, temple or sub-district assembly room, comprises four main activities:

- Simple lectures on the advantages of the new stoves in comparison with the traditional one, and how to benefit from them through correct use of the stove (principles of thermodynamic characteristics of hot flue gases after complete combustion and how a step grate and a chimney enhance such a complete combustion): mainly through the use of audio-visual aids (posters, booklets in local language, block models of the different stoves, slides and videotapes), concrete examples and with the active participation of the farmers.

- Visits to farmers who are already using the improved stoves to promote the exchange of experience between palm sugar producers, and to demonstrate how such stove can be used correctly.

- Construction of a demonstration stove by using knock down mould at a voluntary trainee's place, in order to demonstrate the key steps in stove building and the quality requirements for the materials to be used).

- The project team then make an appointment for the following week to show how to cut the internal part of the improved stove when its body is dry enough.

As numerous farmers have already adopted the new stoves in neighbouring areas, the extension activities will emphasize the exchange of knowledge and experience between them and the trainees through talks and visits to their improved evaporators.

Other extension activities.

Following the project activities of rehabilitation of the palmyra palm, starting in 1987 the Sathing Phra district authorities organize an annual "Palmyra Palm Fruit Day" in order to promote the sugar palm products and their improvement.

Local radio and newspapers have also been used to disseminate knowledge about the availability of improved and adapted open-pan stoves for palm sugar production. Incidentally, this simple technology is now also used in other local small-scale cottage industries such as dried shrimp, cashew nut, fish sauce or mushroom productions.

Results and Discussion

Regarding stoves and their knock down moulds.

Interviews with about 50 producers using one-pan stoves gave these statements:

- The most frequent initial reason given by smaller producers for building a one-pan stove with a chimney and grate was the high quality sugar which could be produced of whiter color and more easily precipitated to solid sugar.

- Producers also anticipated that there would be a saving of time and wood when compared with the traditional stove.

- Producers in general claimed that it was easy to sell this high quality sugar and a premium could be obtained of 10 to 20 baht for sugar produced with the new stoves. Honey buyers also claimed that they gave a premium of 10 to 20 baht for colour and for sugar that would precipitate produced by the new stoves.

- The new stove users all agreed that they could burn light wood such as palm leaf and male and female inflorescences very efficiently by using stoves equipped with a chimney and grate while they were unable to do so with traditional stove.

At present, due to the government's policy on the abandonment of wood concessions, there has been an increase in the cost of para rubber wood which is in high demand by other industries around Haad Yai, Songkhla province. As fuelwood has become a major cash cost in sugar production, this brings about the problem of high production costs for the palm sugar producers. Palm petioles, which are abundant and available in the area, are increasingly collected into big piles before the sugar tapping

season begins. The improved stoves are essential for survival of the cottage palm sugar industry and they could make this industry almost self-sufficient in fuelwood.

- All producers realize that the smoke and tars from burning fuel wood pose a hazard to health especially of the lungs. Processing the sugar products using stove with a chimney is not only more convenient but also safer.

- The portable metal knock down moulds are now being used widely for constructing clay soil stoves in Sathing Phra area. A handbook providing considerable information concerned the operation of the transportable metal knock down mould for these two types of stove is currently being published for the producers.

Regarding the extension activities

Data displayed in Table 1 show the evolution of the number of improved stoves built in 1990 extension year. The data show that the adoption of the standard improved evaporators constructed by the portable metal knock down mould for two-open-pan stoves, has been very rapid in Sathing Phra area. The one-open-pan stove with a grate and chimney attracted the greater interest among small producers. Almost 74% of the target group of producers have now adopted the one-pan stove.

Conclusion

Palm sugar production in Sathing Phra peninsula, southern Thailand, will remain available to the poor producers as long as the sugar palm trees and the improved stove which is able to burn light wood from the tree residues in particular palm petioles are exploited. This production remains a traditional process-skill intensive and utilizing simple appropriate technology of wood energy systems improvement. Now, the processing of palm sugar in the cottage industry is energy self-sufficient the same as the processing of sugar cane in the factories utilizing bagasse to provide heat and power for the mills. White cane sugar is produced using modern vacuum evaporator and centrifugal separation, giving an almost pure granular sucrose product while the basic process for precipitated solid palm sugar has hardly changed. However, the price of Sathing Phra palm sugar cake sold in the Haad Yai and Songkhla markets is the same as the fixed price white cane sugar. Thus, the traditional technology in household palm sugar production seems as efficient as capitalist cane sugar production

Table 1. Evolution of the number of improved stoves built on Sathing Phra peninsula in 1990.

Tambon/Village	Trainees Number	Type of stove	
		One pan	Two pan
Kukud			
Tanod Rob	41	15 (11)*	20 (20)
Klong Ree			
Po Mai	30	15 (4)	3 (1)
Jathing Phra			
Pang Luk	41	27 (10)	5 (2)
Bo Danh			
Bo Danh	22	18 (6)	-
Sanamchai			
Sanamchai	-	4 (0)	-
Total	134	79 (33)	28 (23)

* Numbers in brackets are the numbers of stoves constructed by portable metal knock down moulds.

However, using only the one-open-pan stove, there are still time and energy-saving constraints to the processing of sugar cake by tapping households.

By reducing input costs, that is the money paid for fuelwood, and by involving all members of the tapping household in performing the extra step of producing solid cake themselves instead of selling honey, and so increasing the money obtained from sugar production, the producers are able to increase their income significantly.

However, the absence of protection of the Thai national sugar industry could easily jeopardize the future of palm sugar production beyond its traditional market niche surrounding its specific uses. The market channel for high quality and diversified sugar palm products might be a definitive solution ensuring the possibility of maintaining these palm sugar-based farming systems.

Acknowledgements

The authors are grateful to the Regional Wood Energy Development Programme (GCP/RAS/131/NET), FAO for supporting the extension phase of this work from 1990 to 1992. The authors would like to thank Mr. Alan Geater for commenting on earlier drafts of this article.

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